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Concurrent Assessment of Alprazolam and Propranolol Hydrochloride in Mixed Compositions Using UV-Visible Spectrophotometry, HPTLC, and Reverse Phase High-Performance Liquid Chromatography (RP-HPLC) Techniques: Development and Validation

G.Pavithra
India

This study presents the development and validation of analytical methods for the simultaneous estimation of alprazolam and propranolol hydrochloride in combined pharmaceutical formulations using UV-Visible spectrophotometry, High-Performance Thin-Layer Chromatography (HPTLC), and Reverse Phase High-Performance Liquid Chromatography (RP-HPLC). Method development involved optimization of analytical parameters including wavelength selection, solvent systems, and chromatographic conditions to achieve effective resolution of both analytes.UV-Visible spectrophotometric analysis was performed using simultaneous equation and absorbance ratio methods. HPTLC separation was achieved on silica gel 60 F254 plates using a specific mobile phase, followed by densitometric scanning. RP-HPLC was conducted on a C18 column with an optimized mobile phase under isocratic conditions, with detection at suitable wavelengths for each drug. All methods were validated according to ICH Q2(R1) guidelines.The methods exhibited excellent linearity for alprazolam (2–10 µg/mL) and propranolol hydrochloride (10–50 µg/mL). Recovery studies confirmed accuracy, with results ranging from 98.5% to 101.2% for both drugs. Precision studies showed %RSD values below 2%. LOD and LOQ were found to be within acceptable limits for each technique. The RP-HPLC method showed superior resolution and sensitivity compared to the others.The validated UV, HPTLC, and RP-HPLC methods provide reliable, precise, and accurate procedures for the simultaneous determination of alprazolam and propranolol hydrochloride in bulk and combined dosage forms. These methods are suitable for routine quality control analysis and can be applied in pharmaceutical industry settings.

Biography

G.Pavithra has her own experience in valuation and passion for ML and data. The research team built this model after many years of experience in research, evaluation, work in both hospitals and scientific laboratories. This approach meets all the requirements for precise, specific, sensitive diagnostics.

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pavithra.pharmacy28@gmail.com

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